

ART. III.—*Examination of Coloured School Children's Eyes.* By
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EXAMINATIONS of schools in Europe, in order to determine the refraction of the scholars' eyes, have of late years been of quite frequent occurrence.

Jäger was one of the first to make examinations, and the only one to determine the refraction in new-born children; he was followed by Cohn, of Breslau, who tabulated 10,060 school children. Erismann and Dobrowsky of St. Petersburg, Hofman of Wiesbaden, and many other European oculists, made examinations of schools and universities, and all found an increase of myopia in the higher classes of the lower schools, and in the higher schools and universities alarmingly high percentages of myopia. The increase of myopia could, in a great part, be shown to depend on badly lighted studyrooms, unsuitable seats and desks, too long continuous hours of study, and a confined range of vision.

Jäger's examination is quite interesting, inasmuch as all his calculations had to be made with the ophthalmoscope, no other means being possible under the circumstances, and as there are but few, if any, who excel him in the use of that instrument, his results must be regarded as accurate. He found 75 per cent. of myopia amongst the new-born children, ranging in degree from a $\frac{1}{20}$ to a $\frac{1}{4}$. Only in a few cases was posterior staphyloma (conus) present. This very large percentage of myopia is due to the great thickness of the infantile lens, and to the as yet imperfectly developed zonula zinnii, not being able to exert any influence on it. Cohn tabulated 10,060 school children, 6059 of whom he examined personally. He examined the scholars with test-types at 4 feet distance, and in this way most of the cases of myopia less than $\frac{1}{30}$ escaped, and were reckoned to the emmetropes. The same author¹ in 1871 examined some 240 village school children, and found 88 per cent. apparently emmetropic. In each of the apparently emmetropic eyes he put s. atropia. When the accommodation was completely paralyzed, the emmetropes were again examined, and as a result all the emmetropes became hypermetropes; the greatest number ranging in degree from a $\frac{1}{30}$ to a $\frac{1}{20}$ of hypermetropia.

Erismann² found in his investigations as high as 42 per cent. of myopia in certain classes, and only 26 per cent. in the whole school, while hypermetropia in the lower classes amounted to two-thirds. Commenting on this large number of H. in the lower classes, he adds: "Hypermetropia is the normal refraction of the healthy youthful eye, and not that which we denominate emmetropia, still less myopia, as they are only the excep-

¹ V. Græfe's Archiv, vol. xvii., part 2, p. 315.

² V. Græfe's Archiv, vol. xvii., part 1, p. 1.

tion at that age. . . . The smaller portion remain hypermetropic; but the *greater number become myopic*, having passed through a transitory state, *i. e.*, emmetropia; some remain, however, in this state through fortunately favouring circumstances."

Donders' views on this subject are decidedly in opposition to the above. His doctrine is, youth hypermetropia, adolescence emmetropia, old age hypermetropia *acquisita*.

Donders, in his classical work,¹ remarks, under Chapter V. :—

"*The Emmetropic Eye*.—Slight degrees of H. are in youth not even to be proved, much less to be reduced to their numerical value; indeed, whenever a deficiency of refractive power exists in the eye, when in a state of *absolute rest*, it is supplied by the accommodation. And even if the eye in paralysis of accommodation should be emmetropic, the tone of the accommodation alone affects a slight degree of myopia, consequently the actually emmetropic vision requires, in a certain sense, a minimum of H., and that minimum is capable of no accurate taxation, because to the tone itself a certain latitude, perhaps from $\frac{1}{100}$ to $\frac{1}{40}$, should be allowed.

"In this sense, and it is practically the only correct one, the majority of eyes are undoubtedly emmetropic."

The selection of coloured scholars was not made without good reasons. Heretofore nearly all the examinations have been made in Germany, and, needless to remark, on whites. It is to most familiar that there is a very large percentage of myopia amongst the students in the gymnasiums and universities of Germany; the percentage is much greater there than in the other countries of Europe. The Germans acquire myopia by their long years of study, having perhaps inherited a predisposition to it, or inherited it already developed and increased in attaining their manhood. Our coloured brethren as a rule never did enjoy a thorough system of education. The present generation in New York may be said to enjoy as thorough as the city affords; but their forefathers did not; neither have they been raised to such pursuits as demand a very close application of the eyes, *viz.*, engraving, etc.; *cæteris paribus* the negro's eye should approach nearest to a natural eye, *i. e.* normal eye. The very best material for examinations of this kind could be obtained in the Southern States, where, until of late years, the negro was unjustly debarred from the luxury of spoiling his eyes, *i. e.* a modern education.

The examination was begun last spring, and finished before the summer vacation. In examining the scholars, Snellen's test types were also—"A" and "E" old and new series—placed in the wall of the study room. The scholar to be examined was placed 30 feet distant from test types, and each eye alternately tested on card "A" for example, the result being noted; then convex and concave glasses were placed in turn before each eye, and

¹ Accommodation and Refraction, 174, German edition, 148.

pupil asked to read card "E." This changing of the examined card was to prevent learning by heart and consequent deception on the part of the scholars. Each pupil was likewise tested for colour blindness. Cohn was very fortunate in being able to examine two hundred and forty scholars' eyes under the influence of *s. atropiæ*, an opportunity which does not present itself very often, and such a procedure was entirely out of the question in the present instance, particularly as the coloured children feared from the first, that their eyes were by a species of legerdemain to be taken out, and then and there replaced: a belief, by the way, which is not confined to coloured children, but to very large children of the Caucasian race. Not being able to put *s. atropiæ* into the scholars' eyes, we put it in our own, so as to thoroughly paralyze the action of the ciliary muscle, and kept our eyes in that condition during the ophthalmoscopic examination of the scholars' eyes. Each scholar's eyes were separately examined with the ophthalmoscope in the upright image, and the correcting glass used to view fundus distinctly gave the refractive condition of the examined eyes. In this manner the examination was made with all due accuracy. Our eyes being under the free influence of *s. atropiæ*, we were not able to use our accommodation, and the glass used to see the fundus gave the desired refraction.

In theory it is quite simple to estimate the refraction by means of the ophthalmoscope—the refraction of the examiner's eyes being known, say emmetropic, and if he sees distinctly the fundus of examined eye without accommodating or the aid of glasses, then is the refraction of examined eye likewise emmetropic; but if he does not accommodate, and can only see with minus or plus glasses as correction, then there is myopia or hypermetropia, of a degree indicated by the glass, plus the distance of nodal points of both eyes in myopia and less the distance in hypermetropia. When the examining surgeon is ametropic, then his refractive condition must be taken into consideration.

Apparently it involves a small amount of calculation in any given case, when the refraction is obtained, but a very important factor must not be lost sight of, viz., can the examiner avoid accommodating, and rely on his correcting lenses in the ophthalmoscope in order to see the fundus of an examined eye distinctly?

We all know how difficult it is, when examining in the direct or upright image, to avoid using our accommodations, and what a large amount of practice in the use of the ophthalmoscope it demands, before we can say that our ciliary muscle is under our control; in order to avoid this difficulty, and place the results of an examination beyond dispute, *s. atropiæ* must be used either in the eyes to be examined, if possible, or in the examiner's own eyes.

Two public schools were examined; both together contained 457 scholars.

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The following is the result of the examination : 431 emmetropic, 94 per cent. ; 12 myopic, 2.6 per cent. ; 14 amblyopic, 3 per cent.

Public School No. 3 contained 293 scholars : 274 emmetropes, 10 myopes, 9 amblyopes.

Public School No. 4 contained 163 scholars : 157 emmetropes, 2 myopes, 5 amblyopes.

School No. 3 has a percentage of 3.4 per cent. myopes, while School No. 4 has only 1.2 per cent. myopes ; the explanation is that School No. 3 has an excellent corps of teachers, and is really the coloured high school, and, in consequence of its superior advantages, is frequented by scholars of well-to-do parents from all parts of the city proper, Manhattanville, and Harlem.

School No. 4 has only a local attendance. Had we examined an equal number of white scholars, we are fully satisfied that our examination would show a much larger percentage of myopia than that found amongst the coloured scholars, viz., 2.6 per cent.

Public School No. 3. Primary Department.

Classes.	Boys.	Girls.	Ages.	Emmetropes.	Myopes.	Amblyopes.
1st and 2d Class,	19		9—17	18	0	1
“ “		21	“	19	0	2
3d and 4th “	32		7—15	32	0	0
“ “		36	“	35	0	1
5th and 6th “	27		5—12	26	0	1
“ “		36	“	35	0	1
Total,	171			165	0	6
Per cent.				96.5		3.5

Grammar Department. School No. 3.

Classes.	Boys.	Girls.	Ages.	Emmetropes.	Myopes.	Amblyopes.
1st and 2d Class,	8		12—19	6	2	0
“ “		16	“	13	2	1
3d and 4th “	14		10—17	11	3	0
“ “		19	“	18	1	0
5th and 6th “	13		10—17	13	0	0
“ “		14	“	12	2	0
7th and 8th “	24		9—15	24	0	0
“ “		14	“	12	0	2
Total,	122			109	10	3
Per cent.				89.3	8.2	2.5

In the above public school there were nine cases of amblyopia, three of which depended on astigmatism, and for convenience, put under that head, as likewise one case of mixed refraction, the one eye being myopic, whilst

the other was hypermetropic ; the remaining five cases depended on macula cornea.

Primary Department. Public School No. 4.

Classes.	Boys.	Girls.	Ages.	Emmetropes.	Myopes.	Amblyopes.
1st and 2d Class,	20		6—13	20	0	0
“ “		24	“	24	0	0
Total,	44			44		

Grammar Department. Public School No. 4.

Classes.	Boys.	Girls.	Ages.	Emmetropes.	Myopes.	Amblyopes.
1st and 2d Class,	15		12—19	15	0	0
“ “		26	“	23	1	2
3d and 4th “	12		11—18	12	0	0
“ “		30	“	29	0	1
5th and 6th “	14		11—17	14	0	0
“ “		23	“	20	1	2
Total,	120			113	2	5
Per cent.				94.2	1.6	4.2

In Public School No. 4 there were only five cases of amblyopia, two of which depended on astigmatism ; the remaining three cases on macula cornea.

The following tables show the number of scholars who were able to read the test types at the given distance with concave and convex glasses. In the majority of cases, in testing with convex glasses the scholars could not see well with them, but making them close the eyes and remain so for a short period of time, then again trying they had a vision of $\frac{20}{20}$. Very few of them but gave the preference to concave glasses, and in about 10 per cent. of the scholars they imagined that the concave glasses magnified the letters, the convex making them smaller.

This preference of concave to convex glasses is easy to explain, inasmuch as it is quite easy for the youthful hypermetropic eye to concentrate divergent rays upon the retina ; but for the same eye to avoid accommodating, which is necessary in order to see with the convex glasses, is at first difficult and only to be obtained with a little practice. The tables for the convex glasses represent the number and degree of facultative hypermetropia in both schools.

Facultative Hypermetropes.

Age.	Boys 125.							GIRLS 164.						
	Numbers of Convex Glasses.													
	72	60	48	42	36	30	24	72	60	48	42	36	30	24
6				1	1					3	1			
7			1	2							2		3	
8			3	2	7	3			1	2	11	3	1	
9			4	3	2	1			1	6	6	5	2	
10		2	6	7	3	2				2	5	8	2	
11			2	2	5	4			4	5	5	3		
12	1	3	4	5	3	4			2	9	4	5	3	
13	1		2	4	2	2			1	1	6	6	2	
14		2	2	4	2			1	1	5	6	5		
15	1	1	5	4	1			1	1	4	4	5		
16	1	1	1	1		1			1	1	1	2		
17			1		1				1					
18				1					2	2				
19					1				1					
Total	4	9	31	36	28	17		2	16	40	51	42	13	
Per cent.	3.2	7.2	24.8	28.8	22.4	13.6		1.2	9.1	24.5	31.1	25.6	7.9	

Only the scholars with an acuity of vision of $\frac{3}{20}$ were tested with convex and concave glasses, and higher degrees of concave than convex glasses were accepted, as can be seen by the following tables, in which we omit the details and give only the general results :—

Age.	Boys 131.								GIRLS 167.							
	Numbers of Concave Glasses.															
	72	60	48	42	36	30	24	20	72	60	48	42	36	30	24	20
6				1	1				1		2	1				
7			1		2							2		1	2	
8			3		4	1	2				2	8		2	3	
9			3	3	3		1				4	9	4	7	1	
10			4	7	4	3	3				2	3	6	2	3	1
11			2	4	4	5	2			3	4	4	5			
12		1	2	6	4	3	3			1	4	5	6	4	2	
13		1	1	4	4	2	1	2			2	2	8	3	1	1
14		1	2	1	3		2		1	1	2	4	6	4	1	
15		1	2	4	4	1				1	2	3	5	2	1	1
16			1	1	1		1					1	1		1	
17							1			1	1					
18										2				1		
19							1			1						
Total	0	4	21	37	35	15	17	2	2	10	26	43	48	19	15	4
Per cent.	0	3	16	27.7	27.4	11.4	12.9	1.6	1.1	5.9	15.8	25.7	28.8	11.5	8.9	2.3

It will be seen from the following table of percentages that amongst boys 3 per cent. more in favour of the concave glasses were found, whilst there is only a difference amongst the girls of 0.4 per cent. in favour of concave glasses.

Scholars.	Convex Glasses.	Per cent.	Concave Glasses.	Per cent.
Boys 191	125	65.4	131	68.5
Girls 240	164	68.3	165	68.7
Total. . . . 431	289	67.	296	68.6

Each scholar was tested with one eye, then with the other; the second column shows the number of scholars who saw $\frac{2}{30}$ with convex glasses, and the fourth the same with concave glasses.

67 per cent. of the 431 examined presented facultative hypermetropia. Erismann found only 43 per cent., while Cohn found as high as 77 per cent. in *their respective* examinations.

The ophthalmoscopic examinations were made in the forenoon, and extended over a period of five weeks, during which time both eyes of the examiner were under the influence of a four-grain solution of s. atropiæ applied three times daily, so that the accommodation was completely paralyzed. Forty-nine of the apparent emmetropes refused to have their eyes examined with the ophthalmoscope any further, in some few cases the mothers not wishing it; the great reason was fear on the part of the scholars, and as we had not time to try and persuade them, they were lost to the ophthalmoscopic examination.

The following tables show the refraction of the scholars' eyes as tested with the ophthalmoscope. First column, ages; second, emmetropia found; and the following, the different degrees of hypermetropia:—

Hypermetropia.

Ages.	Boys 188.											Girls 194.							
	Hypermetropia.											Hypermetropia.							
	Em. ∞	$\frac{1}{80}$	$\frac{1}{38}$	$\frac{1}{30}$	$\frac{1}{24}$	$\frac{1}{20}$	$\frac{1}{17}$	$\frac{1}{15}$	$\frac{1}{14}$	$\frac{1}{13}$	$\frac{1}{54}$	Em. ∞	$\frac{1}{80}$	$\frac{1}{38}$	$\frac{1}{30}$	$\frac{1}{24}$	$\frac{1}{20}$	$\frac{1}{17}$	
6	1		3	2								2	1	2	1				
7	1		3		2				1				2	2	2	1			
8		4	4					1		1			3	8	3	1	2		
9	2		3	3	2	4	1	1	1	1	1		2	7	3		1	1	
10	1	2	7	4	3	1	1	1	1	1		2	6	5	5	2	1		
11	1	3	5	4	3	1	1							6	5	2	4	2	
12	4	4	6	6	1	2				1			2	1	8	5	2	1	2
13	1	3	10	2	4			1	1				3	3	7	9	4	1	
14	2	7	4	2	3	1		1					3	5	5	4	2	1	
15	1	1	3	3	1			2					3	4	5	4	1	1	2
16	1	1	4	2	1			1	1				2	2	3	2	1	1	1
17	2			2								2	1	1	1	1			
18				2								1	1	2	1				
19			1									1		1					
Total	17	25	55	40	20	9	3	9	5	4	1	19	30	62	45	16	13	9	
Per cent.	9	13.4	29.3	21.2	10.6	4.8	1.7	4.8	2.6	2.1	0.5	9.8	15.5	31.9	23.2	8.2	6.7	4.7	

Percentages of Ophthalmoscopic Examinations.	Em.	$\frac{1}{50}$	$\frac{1}{35}$	$\frac{1}{30}$	$\frac{1}{24}$	$\frac{1}{20}$	$\frac{1}{17}$	$\frac{1}{15}$	$\frac{1}{14}$	$\frac{1}{13}$	$\frac{1}{12}$	Total.
Boys . . . 188	9.0	13.4	29.3	21.2	10.6	4.8	1.7	4.8	2.6	2.1	0.5	100
Girls . . . 194	9.8	15.5	31.9	23.2	8.2	6.7	4.7					100
Total . . . 382	9.4	14.4	30.5	22.3	9.4	5.8	3.2	2.4	1.3	1.0	0.3	100

As is shown by the above table of percentages of the 382 apparent emmetropes, examined with the ophthalmoscope, only 9.4 per cent. were found to be emmetropic, whilst 90.6 per cent. were found to be hypermetropic.

The following table comprises the myopes in both schools, male and female; two more females were myopic than males :—

Myopia. Males and Females.

	$\frac{1}{18}$	$\frac{1}{15}$	$\frac{1}{14}$	$\frac{1}{13}$	$\frac{1}{12}$	$\frac{1}{11}$	$\frac{1}{10}$	$\frac{1}{9}$	$\frac{1}{8}$
6									
7									
8									
9									
10	1								
11	...	...	...	1					
12	...	...	...	...	...	1			
13									
14	...	...	1	...	...	...	1		
15	...	...	1	...	...	...	...	1	
16	...	...	...	...	1				
17	...	1	...	...	...	...	1		
18	...	1	...	...	...	...	...	...	1
19									
Total,	1	2	2	1	1	1	2	1	1

The acuity of vision was tested in all cases, but we only make use of the 431 apparent emmetropes.

We believe Snellen's test-types to be the most reliable for distance. His xx can be read by young subjects very often at much greater distance, but taking it as a standard for average vision it is quite good. Very often xx of A series is incorrectly given; for instance, U is rendered as V, Y taken for T, C and G mistaken for O, and there are but few who see the figure 2 distinctly. All these letters have been changed in series E, new edition.

Acuity of Vision.

	$\frac{20-24}{20}$	$\frac{25-29}{20}$	$\frac{30-34}{20}$	$\frac{35-39}{20}$	$\frac{40-44}{20}$	$\frac{45-49}{20}$	$\frac{50}{20}$	Total.
Boys	126	35	22	3	3		2	191
Girls	189	29	18	3	1	1		240
Total	315	63	40	6	4	1	2	431
Per cent.	73.1	14.7	9.3	1.4	0.9	0.2	0.4	100

As can be seen by consulting the above table, 73 per cent. had a normal vision; not quite one per cent. had a vision of $\frac{4}{10}$, whilst the highest found was a vision of $2\frac{1}{2}$ or $\frac{5}{10}$. Still greater degrees of acuity of vision have been found by other examiners, but then they can be regarded as curious cases, and not for a moment to be taken as a standard.

Three cases classified under amblyopia as macula cornea presented a rather singular form of eye disease—hypertrophy of the limbus. All around the cornea at limbus an elevated ring extended, keeping as it were the sclerotic and cornea in position. This ring was grayish-white in colour, devoid of vessels, 3 mm. in width, and $\frac{1}{2}$ mm. to $1\frac{1}{4}$ mm. in height. In the sclerotic there were some fine vessels running towards the limbus, but they did not appear to penetrate into it. The cornea was quite hazy all around its circumference, and the haziness extended about 2 mm. towards its centre. (No colour blindness found among the scholars.)

During the examination of the scholars we found three cases of persistent hyaloid artery, two boys and a girl, and, singular enough, in the left eye of each. Considering the number of scholars in the two public schools examined, and the comparatively few cases on record of persistent hyaloid artery, the number is very large. Are we to expect to find more such cases in the coloured race than in the white? The three cases will soon be published in full. Should our results cause similar examinations of other coloured schools, we would consider ourselves amply repaid for our time and trouble.

ART. IV.—*Spinal Arthropathies.* By S. WEIR MITCHELL, M.D.,
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It has been my good fortune within the last two years to meet with a number of cases of disease of the joints of the legs, associated in each instance with atrophic states of limited groups of muscles, and offering more or less distinct clinical evidence of being due to spinal disease. I shall have occasion, as I proceed, to show how these cases differ from any as yet described, both in their early symptoms, and in their more favourable prognosis, but I shall perhaps make clearer my meaning, if first I call attention, however briefly, to the history of spinal and neural arthropathies, a subject which owes its best study to American and French students. The history of spinal arthropathies is well told by Charcot, in his *Leçons sur les Maladies du Système Nerveux*, Paris, 1872-73, p. 100 et seq. This author distinguishes joint lesions of spinal origin as of two varieties. Those which are acute or subacute and are accompanied with redness, swelling, and sometimes with more or less violent pain. The